

Before the  
**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, DC 20554

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|----------------------------------------|---|----------|
| In the Matter of                       | ) |          |
|                                        | ) |          |
| Amendment of Parts 2 and 97 of the     | ) | RM-10165 |
| Commission's Rules Regarding the 2300- | ) |          |
| 2305 MHz Band.                         | ) |          |
|                                        | ) |          |
| In the Matter of                       | ) |          |
|                                        | ) |          |
| Co-Primary Allocation of 2300-2305 MHz | ) | RM-10166 |
| to the Amateur Radio Service and the   | ) |          |
| Miscellaneous Wireless Communications  | ) |          |
| Service                                | ) |          |

To: The Commission

**REPLY COMMENTS OF ARRL,  
THE NATIONAL ASSOCIATION FOR AMATEUR RADIO**

ARRL, the National Association for Amateur Radio, also known as the American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.405(b) of the Commission's Rules [47 C.F.R. §1.405(b)] hereby respectfully submits its reply comments relative to the Petition for Rule Making filed on or about April 9, 2001 by AeroAstro, Inc. (AeroAstro). These reply comments are also in response to AeroAstro's Comments, and those of MicroTrax, relative to ARRL's above-captioned petition, RM-10165. ARRL filed comments in response to Aeroastro's petition August 1, 2001. These reply comments are timely filed. The AeroAstro Petition proposes that the Commission (1) reallocate the 2300-2305 MHz band on a co-primary basis to both the Amateur Radio Service (ARS) and the Miscellaneous Wireless Communications Service (MWCS); and (2) to impose technical and operational limitations on

Amateur station operation in that band, in order to protect the MWCS. The ARRL Petition proposes the allocation of that band on a primary basis only to the Amateur Service. In the interests of the Amateur Radio Service in continued and improved access to this band, ARRL states as follows:

1. AeroAstro's comments add little of substance to what can be found in its initial Petition. It suggests at the outset that it opposes the upgrade of the present secondary amateur allocation at 2300-2305 MHz to primary status. As well, it requests that maximum power levels in the Amateur Service, which are applicable to almost all Amateur allocations, be reduced because 1500 watts PEP output power is "not typically encountered" at amateur stations operating in that band.<sup>1</sup> As its justification for the proposed power reduction for Amateurs, AeroAstro repeats its mantra that the Amateur Service and "low-power commercial operations" can share the band on a co-primary basis without interference one to the other. The problem is that the mantra is bereft of technical support, either in AeroAstro's Petition or in its Comments. ARRL continues to assert that the proposed co-primary allocation is fundamentally incompatible and would result in restrictions that preclude much or all current Amateur operation in the band, as well as interference.

2. AeroAstro, at page 3 of its comments, acknowledges the many recent incursions of

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<sup>1</sup> This argument is faulty. Amateur stations, like all licensed radio facilities, must utilize at all times the minimum power necessary to carry out the communication desired. 47 U.S.C. §324; 47 C.F.R. §97.313(a). The Amateur Service, being in essence an experimental service, is allowed considerable flexibility in selecting appropriate power levels in most Amateur allocations up to a fixed maximum. That Amateur stations adhere to the "minimum power necessary" rule does not suggest that a lower power maximum is justified for any particular band, and the Commission has refused to reduce the power limit in Section 97.313(b) of the Commission's rules. See, *Amateur Radio Service (Power Measurement)*, 54 RR 2d 723 (1983).

commercial services into Amateur spectrum allocations. The steady erosion of Amateur allocations in the 2300-2450 MHz band has continued, and continues presently. AeroAstro also acknowledges the compression of a variety of Amateur uses into the 2300-2305 MHz band as the result of reallocation decisions elsewhere, especially at 2305-2310 MHz. There is no dispute that the segment near 2304 MHz is uniquely suited to Amateur weak-signal communications, and the remainder of that segment is used and useful for other types of Amateur operations. Finally, AeroAstro acknowledges the clear Congressional policy favoring protection of Amateur operations in the NTIA-transferred bands, including 2300-2305 MHz. The area of dispute is the extent to which AeroAstro's proposed ubiquitous terrestrial SENS operation is compatible with incumbent and future Amateur operation.

3. AeroAstro suggests that its proposed interference avoidance criteria for its commercial operations (no space-to-Earth links; commercial applications limited to less than one watt of power; attenuation of commercial operations below 2300 MHz by -70 dB below the mean power of the unmodulated carrier; and no commercial operation at Ft. Irwin, CA) "closely track NTIA recommendations" for interference avoidance relative to the 2290-2300 MHz Deep Space Network receiver at Goldstone, CA. Each of those criteria is, however, intended to address interference to government operations below 2300 MHz, not interference on a co-channel basis to Amateurs. All that AeroAstro has to say about the latter is that it is "confident" that the proposed level of commercial activity will not cause harmful interference to either Amateur or Government operations." (AeroAstro comments, at 5-6). One is left to speculate on the source of that confidence level, which ARRL absolutely does not share. Attached hereto as Exhibit A is an interference study prepared by the ARRL laboratory, which estimates the interference

suffered by an Amateur receiver from a single point-source radiator operating under the configuration proposed by AeroAstro. As noted, using simple free-space path loss calculations, the noise floor at one kilometer at a typical amateur receiver is on the order of 45.2 dB. This is an intolerable interference level, given the weak received signals that Amateurs utilize on a daily, ongoing basis in this band. Adding to the fundamental incompatibility is the admission of AeroAstro at page 4 of its Comments that "coordination rules used in some co-primary bands will not be feasible here, where both Amateur and commercial users are likely to deploy widely." This, perhaps more than any other factor, evidences the fundamental incompatibility between these two uses, and renders AeroAstro's proposal unworkable.

4. AeroAstro notes that ARRL has not, in its Petition for a primary allocation for the Amateur Service at 2300-2305 MHz, proposed "any special power limitation". It objects to the maximum authorized power level set forth in Part 97 of the Commission's rules (without acknowledging that the technical rules now in place are and have long been applicable to the 2300-2305 MHz band) and seeks to impose a Draconian reduction in Amateur operating parameters, so as to protect its proposed new use. At the same time, it suggests at page 7 of its Comments that it "does not seek to cut back current Amateur operations in the band." Of course it does; there is no other possible outcome, given the power limitations proposed (in the abstract, without technical justification) for the Amateur Service by AeroAstro. Nor has AeroAstro demonstrated any adverse effect to its proposed commercial use from the present rules by which Amateurs now operate at 2300-2305 MHz. It merely makes a blanket, unsupported statement that the present Amateur Part 97 rules are incompatible with commercial applications. If what AeroAstro proposes at 2300-2305 MHz is incompatible with incumbent uses, it obviously should

look for a different band and withdraw its Petition.

5. At page 7 of its Comments, AeroAstro states that it disputes ARRL's claim that the Amateur Service is "uniquely capable" of protecting space research efforts below 2300 MHz, in view of the "high power levels permitted" in the Amateur Service. AeroAstro contrasts Amateur power levels with NTIA's recommendation that commercial facilities at 2300-2310 MHz should use no more than one watt of power.<sup>2</sup> However, it is not necessary for AeroAstro to take ARRL's word for the compatibility between Federal and Amateur uses in the same or adjacent bands; NTIA has made essentially the same point:

The amateur radio service has successfully co-existed with Federal fixed, mobile and radiolocation services (i.e. radar) for nearly fifty years (footnote omitted). As indicated in many of the public comments on the Preliminary Report and the FCC NOI, this sharing arrangement has been successful for both Federal and amateur spectrum users. This success is primarily due to the fact that much of the Federal spectrum usage is located away from populated areas, minimizing potential interference as well as the amateur's ability to utilize the guard bands placed between different types of Federal services (footnote omitted)...<sup>3</sup>

The Amateur Service has indisputably shared spectrum successfully over long periods of time with Federal government uses, notwithstanding the Part 97 power and other technical operating parameters.

6. AeroAstro contends at page 8 of its comments that its proposed co-primary allocation is in the public interest because it will add 5 MHz of UHF spectrum to the Commission's "useful inventory". This can be said of *any* reallocation of UHF spectrum, and does not justify the allocation of 2300-2305 MHz. A more useful showing by AeroAstro would have been some

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<sup>2</sup> See, U.S. Department of Commerce, *Spectrum Reallocation Final Report*, NTIA Special Publication 95-32, February, 1995, at p. 4-16.

<sup>3</sup> *Id.*, at Appendix B, p.2.

claimed inadequacy of the present allocations for the Part 27 Miscellaneous Wireless Communications Service (MWCS) at 2305-2320 MHz and 2345-2360 MHz, since the MWCS is the service to which AeroAstro proposes that the reallocation be made. Furthermore, AeroAstro, in both its Comments and in its Petition, fails to note that there are *two* proposed allocations for services such as that proposed by AeroAstro, at 1670-1675 MHz and 2385-2390 MHz, in ET Docket 00-221. The Commission's proposed allocation of those bands renders AeroAstro's instant Petition to no more than a "wish list" of additional spectrum, which would be usurped to the great detriment of the Amateur Service.

7. AeroAstro, at page 9 of its comments, takes issue with ARRL's claim that an exclusive primary Amateur allocation at 2300-2305 MHz represents the highest and best use of the band. AeroAstro asserts that the ARRL's claim is "demonstrably wrong, considering that commercial users can share the band, under the rules proposed...with little or no adverse impact on Amateur activity." However, if it is "demonstrable" that commercial users can share the band under the proposed rules with little or no adverse impact on the Amateur Service, then it was incumbent on AeroAstro to make that demonstration, rather than to make unsupported conclusory statements. It cannot be seriously asserted that the power and antenna restrictions proposed by AeroAstro for the Amateur Service have "little or no adverse impact" on the Amateur Service. As stated in the ARRL comments, the AeroAstro proposal is a "Trojan Horse." It has no benefit to the Amateur Service over the present allocation status of the band; it would impose preclusive operating conditions on present and future Amateur operations; and it represents yet another in the continuing series of encroachments into the Amateur allocations between 2300 MHz and 2450 MHz. It is time for the Commission to stop those encroachments,

because they have gone too far already. The Commission should recognize its obligations under the Omnibus Budget Reconciliation Act and the Balanced Budget Act to protect Amateur operations, and draw the line here and now. It must preserve the important Amateur uses at 2300-2305 MHz, especially in view of the numerous available alternatives for AeroAstro's technology.

8. MicroTrax filed comments which are akin to, but not exactly supportive of, the AeroAstro Petition. Those comments reiterated MicroTrax' interest in a primary allocation for its Personal Location and Monitoring Service (PLMS) at 2300-2305 MHz under the Part 27 rules. It asserts that its technology requires "an exclusive 5 MHz band" and therefore suggests the creation of two such bands to provide "competitive" PLMS service. Therefore, somewhat vaguely, MicroTrax suggests that a PLMS allocation in this "band without a primary allocation" should be made. Like AeroAstro, MicroTrax conveniently omits any reference to the ET Docket 00-221 proceeding which in fact proposes the allocation of *two* bands which are suitable for MicroTrax' technology. MicroTrax incorporates by reference its petition, RM-9797, seeking several alternative allocations. However, that Petition was fully adjudicated and incorporated in the *Notice of Proposed Rule Making*, FCC 00-370, 15 FCC Rcd. 22657, which specifically *did not propose to allocate 2300-2305 MHz to the PLMS*, but instead proposed the 1670-1675 MHz and 2385-2390 MHz bands for Microtrax' or AeroAstro's purposes, among others. The MicroTrax and AeroAstro proposals for intrusive, or exclusive, commercial use of the 2300-2305 MHz band are, in view of the pendency of ET Docket 00-221, gluttonous, to say the least.

9. In summary, ARRL would reiterate that the AeroAstro petition is untimely, in that the Docket 00-221 proceeding has not been finalized. The bands 1670-1675 MHz and 2385-2390

MHz, and the existing allocations for MWCS are not shown to be, nor are they, in any way inadequate to accommodate the use proposed by AeroAstro herein. AeroAstro has failed to demonstrate that its proposed commercial use is compatible with incumbent Amateur operation. In fact, there is no such compatibility: the severe power and antenna limitations which AeroAstro seeks to unilaterally impose on the Amateur Service are completely insufficient to permit even current Amateur operations in the band, much less any future uses. The instant AeroAstro petition is defective in the foregoing respects and should therefore be dismissed, and the ARRL Petition granted.

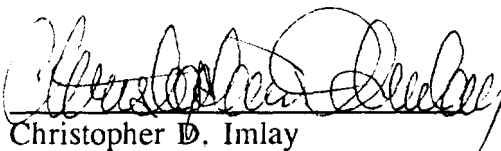
Therefore, the foregoing considered, ARRL, The National Association For Amateur Radio, respectfully requests that the Commission dismiss the AeroAstro Petition, RM-10166. Instead, it should propose, by a Notice of Proposed Rule Making, to create a domestic primary allocation for the Amateur Service at 2300-2305 MHz, as proposed in RM-10165.

Respectfully submitted,

**ARRL, THE NATIONAL ASSOCIATION  
FOR AMATEUR RADIO**

225 Main Street  
Newington, CT 06111

By:

  
Christopher D. Imlay  
Its General Counsel

BOOTH FRERET IMLAY & TEPPER, P.C.  
5101 Wisconsin Avenue, NW  
Suite 307  
Washington, DC 20016-4120  
(202) 686-9600

August 16, 2001

## EXHIBIT A

## Estimation of the Interference from a Single Spread-Spectrum Emitter to an Amateur Station Receiver at 2304 MHz

Prepared by Ed Hare, W1RFI, ARRL Laboratory Supervisor

These calculations estimate the interference at distances of 30 meters and 1 kilometer from a single spread-spectrum emitter consistent with the AeroAstro petition to a modest amateur station narrow-band weak-signal receiving system at 2304 MHz. This is intended to be a typical interference scenario, not a worst-case analysis. Many amateur stations use more sensitive equipment and much higher antenna gains on the 2.3 GHz Amateur band than shown in this example report. Results are given in Tables 1 and 2.

The transmitter is assumed to be one watt. The transmitter antenna gain is assumed to be 0 dBi. The transmitter is assumed to have a uniform power spectral density (PSD) spread over 2 MHz.

The receiving station is assumed to have an antenna with a gain of 10 dBi and a line-of-sight, free-space propagation to the transmitter. The bandwidth of the narrow-band system is presumed to be 2500 Hz. The receiving station's antenna gain is assumed to be a modest 10 dBi. The receiving station's noise figure is assumed to be 6 dB, a value intended to include thermal and ambient noise.

The following formula from Recommendation ITU-R P.525 is used to calculate the free-space path loss between the isotropic antennas:

$$L_{bf} = 32.4 + 20 \log f + 20 \log d \quad \text{dB}$$

where:

$L_{bf}$ : free-space basic transmission loss (dB)  
 $f$ : frequency (MHz)  
 $d$ : distance (km)

The on-tune rejection (OTR) factor was calculated using the following formula:

$$OTR \approx 10 \log (B_T / B_R) \quad B_R \leq B_T$$

where:

$B_R$ : interfered receiver 3 dB bandwidth (Hz)  
 $B_T$ : interferer transmitter 3 dB bandwidth (Hz)

Table 1

**Interference to Noise (I/N) Ratio from a 1-watt Spread-Spectrum Transmitter  
to a Single-Sideband Receiver (30 meters separation)**

| Parameter                                                          | Value       | Notes                                          |
|--------------------------------------------------------------------|-------------|------------------------------------------------|
| Frequency                                                          | 2304 MHz    | Amateur weak-signal frequency                  |
| Transmit spread                                                    | 2 MHz       |                                                |
| Total transmit power                                               | 0 dBW (1 W) | As proposed by AeroAstro                       |
| Transmit antenna gain                                              | 0 dBi       |                                                |
| Path distance                                                      | 0.03 km     |                                                |
| Basic path loss                                                    | 69.2 dB     |                                                |
| On-tune rejection (OTR)                                            | 29.0 dB     | $10 \log (2 \text{ MHz}/2500 \text{ Hz})$      |
| Power at receiver station in 2500 Hz bandwidth (isotropic assumed) | -98.2 dBW   |                                                |
| Receive antenna gain                                               | 10 dBi      |                                                |
| Power at receiver antenna terminal in 2500 Hz BW with antenna gain | -88.2 dBW   |                                                |
| Noise in 2500 Hz bandwidth with 6 dB noise figure                  | -164 dBW    |                                                |
| Thermal noise in 2500 Hz                                           | -170 dBW    |                                                |
| Thermal noise 1 Hz ( $kT_0$ )                                      | -204 dBW    | Boltzmann's constant and $T_0 = 270 \text{ K}$ |
| Interference-to-noise ratio (I/N)                                  | 75.8 dB     |                                                |

Conclusion: At a distance of 30 meters, a single spread-spectrum emitter under the conditions stated would raise the amateur receiver noise floor by 75.8 dB.

Table 2

**Interference to Noise (I/N) Ratio from a 1-watt Spread Spectrum Transmitter  
to a Single-Sideband Receiver (1 km separation)**

| Parameter                                                          | Value       | Notes                                          |
|--------------------------------------------------------------------|-------------|------------------------------------------------|
| Frequency                                                          | 2304 MHz    | Amateur weak-signal frequency                  |
| Transmit spread                                                    | 2 MHz       |                                                |
| Total transmit power                                               | 0 dBW (1 W) | As proposed by AeroAstro                       |
| Transmit antenna gain                                              | 0 dBi       |                                                |
| Path distance                                                      | 1 km        |                                                |
| Basic path loss                                                    | 99.6 dB     |                                                |
| On-tune rejection (OTR)                                            | 29.0 dB     | $10 \log (2 \text{ MHz}/2500 \text{ Hz})$      |
| Power at receiver station in 2500 Hz bandwidth (isotropic assumed) | -128.6 dBW  |                                                |
| Receive antenna gain                                               | 10 dBi      |                                                |
| Power at receiver antenna terminal in 2500 Hz BW with antenna gain | -118.6 dBW  |                                                |
| Noise in 2500 Hz bandwidth with 6 dB noise figure                  | -164 dBW    |                                                |
| Thermal noise in 2500 Hz                                           | -170 dBW    |                                                |
| Thermal noise 1 Hz ( $kT_0$ )                                      | -204 dBW    | Boltzmann's constant and $T_0 = 270 \text{ K}$ |
| Interference-to-noise ratio (I/N)                                  | 45.2 dB     |                                                |

Conclusion: At a distance of 1 kilometer, a single spread-spectrum emitter under the conditions stated would raise the amateur receiver noise floor by 45.2 dB.

## CERTIFICATE OF SERVICE

I, Christopher D. Imlay, do hereby certify under penalty of perjury that I caused to be served, this 16th day of August, 2001, via United States Mail, postage prepaid, a copy of the "REPLY COMMENTS OF ARRL, THE NATIONAL ASSOCIATION FOR AMATEUR RADIO" on the following:

Bruce Franca, Chief\*  
Office of Engineering and Technology  
Federal Communications Commission  
445 Twelfth Street, S.W., Room 7C-155  
Washington, D.C. 20554

Julius Knapp, Deputy Chief\*  
Office of Engineering and Technology  
Federal Communications Commission  
445 Twelfth Street, S.W., Room 7B-133  
Washington, D.C. 20554

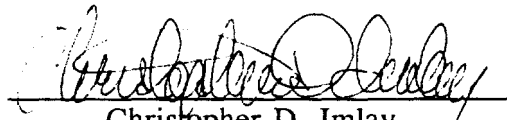
Karen E. Rackley, Chief\*  
Technical Rules Branch  
Office of Engineering and Technology  
Federal Communications Commission  
445 Twelfth Street, S.W., Room 7A-161  
Washington, D.C. 20554

Tom Derenge, Chief\*  
Spectrum Policy Branch  
Office of Engineering and Technology  
Federal Communications Commission  
445 Twelfth Street, S.W., Room 7A-140  
Washington, D.C. 20554

Fred Thomas, Chief\*  
Spectrum Coordination Branch  
Office of Engineering and Technology  
Federal Communications Commission  
445 Twelfth Street, S.W., Room 7A-164  
Washington, D.C. 20554

Mitchell Lazarus, Esquire  
Fletcher, Heald & Hildreth, PLC  
1300 North 17th Street, 11th Floor  
Arlington, VA 22209  
Attorney for AeroAstro, Inc.

Gregg P. Skall, Esquire  
Pepper & Corazzini, LLP  
1776 K street, N.W., Suite 200  
Washington, D.C. 20006-2334  
Attorney for MicroTrax

  
Christopher D. Imlay

\* denotes hand delivery